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ABSTRACT

Epistemological development is one of the expected outcomes of higher education. A longitudinal study of the epistemological development of 77 students upon entrance into college and again at the beginning of their sophomore year revealed that both males and females increased their intellectual complexity. Interviews were conducted during the fourth through ninth weeks of the fall semester of the subjects' freshman and sophomore years. Males demonstrated more growth than did females. An analysis of students' perceptions of their learning environments obtained from interviews revealed subtle differences in the environments experienced by men and women. Individual learning styles changed during the freshman year, but did not appear to impact epistemological growth differently for men and women. The challenges posed by differential environmental impact on male and female epistemological development are outlined, and recommendations are offered for creating equitable learning environments. (Author/TJH)

THE IMPACT OF THE FRESHMAN YEAR ON EPISTEMOLOGICAL DEVELOPMENT: GENDER DIFFERENCES

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Abstract

Epistemological development is one of the expected outcomes of higher education. A longitudinal study of students' epistemological development upon entrance to college and again at the beginning of their sophomore year revealed that both males and females increased in intellectual complexity. However, males demonstrated more growth than did females. An analysis of students' perceptions of their learning environments obtained from interviews revealed subtle differences in the environments experienced by men and women. Individual learning styles changed during the freshman year but did not appear to impact epistemological growth differently for men and women. The challenges posed by differential environmental impact on male and female epistemological development are outlined and recommendations are offered for creating equitable learning environments.

THE IMPACT OF THE FRESHMAN YEAR ON EPISTEMOLOGICAL DEVELOPMENT: GENDER DIFFERENCES

The outcomes of postsecondary education are a major part of the current discourse on the quality of higher education. Review of the various reports issued regarding the status of higher education reveals that the definition of outcomes of college varies considerably. One useful way to organize these varying definitions is Astin's (1973) taxonomy of college outcomes. He divides outcomes into two major categories: cognitive and affective. Cognitive outcomes include intellectual processes such as reasoning, analysis and knowledge comprehension while affective outcomes refer to attitudes, values, and personality characteristics. Astin further subdivides cognitive outcomes into those assessed through psychological data from which internal states of intellectual maturity are inferred (such as critical thinking) and those assessed through behavioral data resulting from observation of students (such as level of educational attainment). This paper focuses on the cognitive-psychological dimension of Astin's taxonomy.

Within the cognitive-psychological dimension numerous definitions of the concept of intellectual development exist. A particularly valuable tradition is that of epistemological development. Piaget's (1926) work is considered the foundation of this area which focuses on the evolution of thought structures characterized by qualitatively different assumptions about knowledge or truth. Numerous researchers have extended Piaget's conception of epistemological development beyond formal operations to chart postformal thinking in the adult years (Commons, Richards, & Armon, 1984). Although these perspectives vary regarding the nature of postformal thought, Benack (1984) articulates commonalities of these perspectives as they relate specifically to epistemological development. Perry (1970) provided a

description of epistemological development in the college years. The first five positions of Perry's (1970) scheme of intellectual development represented different assumptions about knowledge. King (1977) and Kitchener's (1977) Reflective Judgment model, constructed in part to clarify the epistemological dimension of Perry's work, described stages represented by assumptions about knowledge and the way a person justifies beliefs or decisions. Belenky, Clinchy, Goldberger, and Tarule (1986) described a scheme of five perspectives that represent women's assumptions about knowledge, developed in part as a response to the male foundation of Perry's work.

These models project changes in the direction of more complex epistemological development across the college years. Mentkowski, Moeser, and Strait (1983) reported increased complexity on the Perry scheme, and numerous longitudinal studies demonstrate an increase in reflective judgment (Kitchener & King, in press). It is in the area of reflective judgment research that research has been conducted to suggest that increases in epistemological development are attributable to the college experience. Shoff (1979) reported that seniors had higher reflective judgment scores than two groups of adult freshmen who were the same age or older than the seniors. Strange and King (1981) found significant differences in reflective judgment by class but not by age in a study including 18 and 22 year old freshmen and 22 and 26 year old seniors. However, studies by Lawson (1980), Glatfelter (1982), and Schmidt (1985) suggested that age may be a relevant factor for older students, particularly women. Finally, college students scored higher than non college adults on reflective judgment (Kitchener & King, in press).

Research on gender differences in epistemological development is less sophisticated. Gender differences have emerged in moral and psychosocial development but results of research on gender differences in intellectual development are inconclusive. Perhaps this is due in part to the broad range

of institutional settings and student characteristics covered by epistemological development research. It has been suggested (Welfel, 1982) that simple distinctions by sex and year in college are insufficient to clarify differences in a complex developmental process. Some evidence exists that gender differences involve qualitative patterns within epistemological stages (Baxter Magolda, in press). This study investigated gender differences in epistemological development in the freshman year through a combination of environmental conditions and individual characteristics.

Epistemological Development

Theoretical Framework

Theories of epistemological development emerging from the Piagetian tradition share the assumption that evolution of assumptions about knowledge hinges on cognitive dissonance. Resolving dissonance entails adjustment of one's structure or way of making meaning to accommodate new experiences and return the structure to balance. The theoretical framework used here, with one exception, assumes that evolution of stages occurs in a hierarchical, sequential fashion. Perry (1970) described a nine position scheme of development, the first five positions of which represent qualitatively different epistemological structures. Positions One through Three share a dichotomous view of the world, beginning with all knowledge being certain. Position Two allows for temporary uncertainty if it helps students learn on their own but it is not until Position Three that uncertainty in some areas is perceived as legitimate. The existence of these unknown areas expands in Position Four to the nature of most, if not all, knowledge, resulting in the equality of all opinions and the dissolution of the right-wrong world view. Ability to judge the merits of opinions becomes possible again, but in a different form than in initial positions, in Position Five. Knowledge here is contextual and validated based on evidence relevant to the context.

Belenky, Clinchy, Goldberger, and Tarule's (1986) five perspectives of knowing are similar to Perry's positions even though the perspectives are not described as a hierarchy. Women in the first perspective do not perceive their ability to learn from theirs' or others' voices. The ability to learn from others emerges in the second perspective of received knowledge. Women's own voice becomes legitimate in the third perspective of subjective knowledge because the recognition of uncertainty diminishes the importance of authority's voices. Reliance on intuition of personal experience increases in this stage although it is often not expressed. The fourth perspective represents a transition to thinking about knowledge either through a logical, impersonal process (separate knowing) or a subjective, empathic process (connected knowing). Critical judgment of knowledge occurs in the fifth perspective in which knowledge is constructed in a context. The match between these perspectives and Perry positions is close with the exception of the third stage of each scheme. The female focus on uncertainty in subjective knowledge seems initially incongruent with the dichotomy of known and unknown of Perry's Position Three. The discovery of one's own voice might overshadow certainty that still exists, as might the hesitancy to express opinions.

Kitchener and King's (1981) reflective judgment (RJ) model encompasses many aspects of both Perry's and Belenky et al.'s work, perhaps because it was developed using both genders. The assumptions of certainty and uncertainty in the first three stages match Perry's scheme with the exception that the RJ model includes reliance on biases to resolve stage three uncertainty. In that respect it matches Belenky et al.'s third perspective. Justification of belief in stage four adds logic to biases to resolve uncertainty. Stages three and four together can be viewed as a more detailed account of the transition from certainty to uncertainty encompassed in Perry Position Three. Similarly stages five through seven offer a similar account of the transition

from uncertainty of all knowledge to contextual knowledge. Stage five involves a subjective justification of knowledge using rules of inquiry particular to a context. These rules are generalized as knowledge is gained in different contexts, allowing for support of some beliefs over others (stage six). Certainty of knowledge returns, albeit in a new form, in stage seven in which facts and their interpretation are certain to the extent that they can be synthesized into coherent explanations supported by evidence. Despite the differences that do exist in Perry's, Belenky et al.'s, and Kitchener and King's models, the three collectively contribute a comprehensive and coherent theoretical framework from which to study epistemological development.

Freshman Year Development

In describing his original scheme Perry (1970) indicated that dualism was most often represented in the early college years. His examples to describe Position 2 were drawn largely from freshmen male students. Further research using the Perry scheme placed both male and female freshmen between Positions 2 and 3 (Baxter Magolda & Porterfield, in press; Moore, 1982). Mentkowski, Moeser, and Strait (1983) reported the dominant position of freshmen women as Position 3 with a significant element of dualistic thinking present. Reflective judgment research, including both genders, placed freshmen in Stage Three of that model (Brabeck, 1984; Kitchener & King, in press). Belenky et al. noted that women they categorized as received knowers, the second perspective in their ways of knowing scheme, were generally young women in their early college careers. Belenky et al. further indicated that some early college women, generally those from advantaged backgrounds, demonstrated subjective knowing. These women tended to keep their subjective thoughts to themselves, prompting Belenky and colleagues to label them hidden multiplists. Thus these studies collectively do not suggest gender

differences in the freshman year with the possible exception that women in multiplicity choose not to express it.

Developmental Change

Cross-sectional and longitudinal research on epistemological development revealed that change occurs slowly. Cross-sectional studies using the Measure of Intellectual Development (Moore, 1982) and the Measure of Epistemological Reflection (Baxter Magolda & Porterfield, in press) showed a gradual increase of Perry position scores with seniors scoring between Positions 3 and 4. No gender differences were evident in this research (Baxter Magolda & Porterfield, in press; Taylor, Moore, Knefelkamp, & Fitch, 1984). Mentkowski, Moeser, and Strait's (1983) all female longitudinal study, which included an assessment after the sophomore year, demonstrated that more overall change occurred in the first two years of college than in the last two.

Reflective judgment research showed an average gain of one-half stage from freshman to senior year, resulting in seniors scoring in Stages 3 and 4. Gender differences appeared in some of these studies but not in others, leaving unclear the existence of such differences in reflective judgment. King and Kitchener (1985) described three studies in which no gender differences appeared in reflective judgment scores. Welfel and Davison (1986) reported that males had slightly higher scores than females at the fourth year of a longitudinal study although the differences was not statistically significant. King and Kitchener (1985) also reported five studies in which gender differences were found. Males scored higher than females in all studies but one. Schmidt (1985) found that nontraditional age freshmen women and traditional age junior women scored higher than their respective male counterparts. King and Kitchener (1985) indicated that over collective studies men score slightly higher than women and the difference increases with age and education. They posed the possibility that higher education has more

effect on male than on female development and cumulatively leads to higher male scores in the senior year. They further noted that studies demonstrating gender differences have generally involved nontraditional students. This raises the question of the role of environmental factors within the college experience and the role of experience outside of college for nontraditional students in influencing epistemological development.

Environmental Influences

The influence of the college environment on various strands of development has been well documented (Chickering et al., 1981; Feldman & Newcomb, 1969). Chickering's (1969) study of psychosocial development led him to articulate specific environmental influences on developing intellectual competence. The two major influences he described were the nature of the curriculum, teaching, and evaluation and the nature of faculty-student interaction. Chickering suggested that flexible curricula, teaching which involved direct experiences and discussion, and evaluation characterized by frequent communication were most likely to foster ability to analyze and synthesize. With regard to faculty-student interaction he hypothesized that friendly and frequent interactions in a variety of contexts increased intellectual competence. Intentional attempts to foster the epistemological development of freshmen and sophomores (Knefelkamp, 1974; Widick, 1975; Widick & Simpson, 1978) confirmed Chickering's hypotheses. Courses were designed on the basis of students' epistemological positions and were characterized by experiential learning, structured discussion, and a personal, supportive relationship between students and instructor. Students exhibited increased complexity of up to one stage at the conclusion of these courses.

Additionally Chickering emphasized the role of a third major influence, the student culture, which mediated the first two. Values advanced by the student culture mediate students' response to learning settings and faculty

contact. Thus the culture can facilitate or inhibit intellectual growth. Collectively these factors appear relevant to the degree a student becomes involved in the college environment, a significant factor in development according to Astin (1984).

Research on environmental factors influencing freshman year development singled out classroom involvement as a significant influence (Terenzini, Theophilides, & Lorang, 1984), noting that neither the quality nor frequency of faculty interaction was significant in the freshman year. Terenzini and Wright (1987) found both academic and social integration to be influential in college students' perceptions of their academic growth. Integration reflected involvement in the academic or social system of the institution and growth included a number of factors ranging from knowledge acquisition to application of abstractions in theories. The authors concluded that academic growth was substantially different for men and women during the first two years of college and cited women's developmental process as more complex than that of men. Specifically, they found that freshman academic integration influenced both freshman and sophomore academic growth for both genders. Social integration, however, was not related to academic integration or growth for men, but was moderately influential in women's freshman year growth. This finding is similar to Straub's (1987) evidence that interpersonal relationships play a greater role in women's early college development than in men's. In addition, social integration was negatively related to sophomore academic integration for women. No significant gender differences were evident in the academic integration scales which are heavily influenced by students' interaction with faculty. Significant gender differences appeared on all three social integration scales for freshmen, with women scoring higher on the social activities and peer relations scales and men scoring higher on the extra-curricular activities scale. These differences remained for sophomores with the exception of the social activities scale difference.

Potential differences exist for men and women in the environmental conditions that influence development. First, substantial evidence exists that traditional learning environments differ in nature for men and women. Hall and Sandler (1982) suggested that inequities in everyday life are carried, sometimes unconsciously, into the postsecondary educational environment. They cited evidence of disparaging comments about women's abilities, less attentiveness to women students' class contributions, overt favoring of male students for class related opportunities, use of sexist language, and differential treatment in asking questions or interrupting speakers as sources of limiting the experience and confidence of female students. Sadker and Sadker (1986) reported that women received less attention from teachers and that the attention they did receive was of lower quality than that afforded men. Belenky et al. (1986) reported numerous descriptions by women of experiences which devalued women's ability. The authors suggested that women do not routinely identify with authority figures because their experience has been one of exclusion from the world of authority. Hall and Sandler asserted that classroom environments value assertive speech, abstract styles, and competitive interchanges - all characteristics perceived as masculine. Belenky et al.'s finding that women tend to avoid competition to avoid isolation would imply women may not participate in the valued pattern. Subsequently, faculty-student interaction and opportunities for participation in discussion may differ for men and women as a result of faculty or student attitudes. This potential difference could lead to different levels of involvement by gender and negatively impact female academic integration.

Second, the student culture experienced by women may impact their environment differently than that of their male counterparts. The student culture as a whole may represent traditional stereotypical expectations for

female sex roles which generally do not include intellectual achievement. Thus the sources of inequity Hall and Sandler (1982) described could be found in the student culture. This may account in part for Belenky et al.'s discovery of hidden multiplists. The female student culture may also represent expectations that are artifacts of female socialization. Women's tendency to focus on attachment to others rather than autonomy (Chodorow, 1978; Gilligan, 1982) may reduce their willingness to express themselves intellectually and increase their emphasis on peer relations.

In both cases, traditional learning environments and student cultures, the potential differences are most likely the result of a combination of environmental and individual factors. Although individual influences have not emerged as significant factors in most research, their consideration in relation to environmental factors warrants mention.

Individual Influences

One individual characteristic that has potential to influence how the student experiences the educational environment is the students' approach to learning. Research on learning styles (Kolb, 1984) described two dimensions through which students approach grasping and transforming information. Gender differences emerged on the grasping dimension (N=1439), with 59% of the men oriented toward the abstract dimension and 41% toward the concrete dimension (McBer & Co., 1986). The abstract dimension represents an impersonal, thinking oriented approach, while the concrete dimension represents involvement in experience and feelings. More of the women were concrete oriented (59%) than abstract oriented (41%). Women at Alverno College (Mentkowski and Strait, 1983) also exhibited a preference for the concrete dimension upon college entrance as well as the reflective observation dimension of transforming information. Reflective observation refers to an internal attempt to understand the world by watching and listening. Strange

(1978) reported that men preferred abstract conceptualization (logical, thinking approach) to reflective observation, a difference not observed in women in that study. Kolb clearly stated that learning styles emerged from a combination of personal preference and environmental influences. He further explained the gender differences he observed by comparing the orientations to male and female socialization.

Mentkowski (1984) discovered that the Alverno entering women students' preferences for reflective observation and concrete experience disappeared by the end of their sophomore year. Mentkowski, Moeser, and Strait (1983) reported that curricular achievement had greater impact on learning style change than did age. The Alverno study also included a measure of Perry position. Entering students were rated as being in dualistic positions whereas graduating students were rated as relativistic. When compared to the learning style data, this data implies a possible connection between learning styles and epistemological development. Strange (1978) studied both learning styles and reflective judgment and reported no specific relationship of the two. However, males in his study scored significantly higher on reflective judgment than females and differed significantly from females in their emphasis on abstract conceptualization. Because these studies report outcomes at differing points in the college experience, data are inconclusive with regard to the relationship of learning styles and epistemological development.

Individual influences other than learning style have not emerged as clear factors in intellectual development. Terenzini, Pascarella, and Lorang (1982) controlled precollege characteristics including gender, academic aptitude, percentile rank in high school class, parents education, and highest degree planned. As a group these characteristics were not related to academic growth. The only individual characteristic related to growth was percentile rank in high school class. Mentkowski, Moeser, and Strait (1983) found that

high school grade point average, parents' education and occupation, and religion were not influential in epistemological development. Age was related to Perry position ratings but was overcome by the college experience as students moved through the college years. Women with prior college experience scored higher on Perry position upon entrance than those with no prior experience as did those who had experienced divorce or death of spouse. Collectively individual characteristics appear less influential than experience.

Research on epistemological development leaves open for question whether the developmental process is different for men and women, what combination of factors influence development for men and women, and whether the rate of development differs by gender across the college years. This paper reports the first two years' results of a five year longitudinal study of epistemological development to address these questions. Assessment of students' epistemological development, learning styles, and perceptions of their college environment provides a picture of development for both genders for the freshman year.

Method

Participants

Participants were randomly selected from the population of freshmen students at a midwestern public institution in 1986. The 101 participants included 50 males and 51 females with similar academic ability. The mean ACT score of the population was 25.8, the average high school grade point average was 3.4, and 70% of the population ranked in the top 20% of their high school class. The mean age of participants was 18. Ninety-five participants participated in the second year interviews at the beginning of their sophomore year. Of those 95, 77 submitted completed instruments for the second year.

Procedures

Epistemological development was assessed with a written instrument, the Measure of Epistemological Reflection (MER), and a semi-structured interview. The MER (Baxter Magolda & Porterfield, 1985) focuses on six domains of epistemological development: the role of the learner in the learning environment, the role of the instructor, the role of peers in learning, evaluation of learning, decision-making in educational contexts, and the nature of knowledge. Short essay questions within each domain ask the respondent to state a preference and provide reasons for the preference stated. The instrument is scored with a rating manual which contains empirically validated reasoning structures within each epistemological development level (Taylor, 1983). The MER was originally designed to measure Perry positions one through five. However, because the rating manual was empirically validated using data from both genders, it contains reasoning structures relevant to Perry's positions and Belenky et al.'s perspectives (Baxter Magolda, in press). A total score is derived from the average of the domain scores. Analysis of interrater reliability (N=752) yielded .80 and interrater agreement ranged from 70% to 80%. Chi-square tests of significance of agreement levels were all significant at p .001 (Baxter Magolda & Porterfield, in press). Validity data includes consistent significant differences across levels of education and a .93 correlation with interviews (Baxter Magolda, 1987).

The interview addressed the same domains included in the MER. The interview provided a less structured format to assess epistemological development to elicit perceptions relevant to gender differences that might otherwise not appear and explore environmental conditions experienced by the student. In a previous study the interview revealed significantly different scores for freshmen, seniors and graduate students (Baxter Magolda, 1987).

The interview questions were open-ended to allow the participants to respond in any way they preferred. Probe questions were used to elicit justification for preferences if it was not provided by the respondent. The interview protocols were scored with the MER rating manual because it contained empirically validated reasoning structures for the first five levels of epistemological development. The rating process also contained a provision for adding new reasoning structures if the manual did not account for those observed in the interview data.

The interview additionally contained three questions to elicit students' perceptions of their college environment. Students were asked to describe their most significant experience during the freshman year, what they valued most from that year, and what changes they would have made in the first year experience. Themes were identified from these responses as well as from the domain responses.

The Learning Styles Inventory (Kolb, 1985) was used to measure preferred approaches to learning. Respondents rank order four responses to 12 items which reveal the extent to which respondents prefer concrete experience, reflective observation, abstract conceptualization, and active experimentation as learning modes. Four learning styles emerge from the combination of these preferences. Published reliability data for the LSI include internal consistency coefficients ranging from .73 to .88 for the four scales and split-half reliability coefficients of .75 to .81 (p .001) on a sample of 268 (McBer & Company, 1985). Validity of the LSI is supported by the relationship of learning style scores to career fields.

Interviews were conducted during the fourth through ninth weeks of the fall semester of the freshman and sophomore years. The written instruments were given to the participants after the interview and were returned by mail. All respondents returned the instruments the first year and 75 of the 95 second year participants returned the instruments.

Results and Discussion

Epistemological Development: Cognitive Structures

Most participants scores were in Positions Two and Three both years as was expected based on the Perry (1970) and Belenky et al. (1986) data reviewed earlier. An analysis of variance of the MER and interview scores for the first year revealed no significant differences between females and males in cognitive structures. The female mean was 2.49 (SD=.29) on the MER and 2.32 (SD=.31) on the interview. The male mean was 2.52 (SD=.33) on the MER and 2.36 (SD=.31) on the interview. The interview scores were slightly lower overall but both measures revealed that females and males were similar upon entrance to college. The second year means for females were 2.71 (SD=.30) and 2.48 (SD=.33) for the MER and interview respectively. Male means were 2.94 (SD=.33) and 2.58 (SD=.38) for the MER and interview respectively. The interview scores remained lower but both MER and interview means indicated that males exhibited higher scores at the beginning of the second year than did females. An analysis of variance of the second year MER scores revealed a significant difference by gender ($F=9.28$ (1), p .003). No significant difference appeared on the interview scores.

A repeated measures analysis of variance comparing the first and second year MER scores revealed significant differences on the basis of year ($F=67.79$ (1), p .0001). Similarly, interview scores revealed significant differences by year ($F=21.11$ (1), p .0001). No significant gender effect appeared in the repeated measure analysis of variance for either measure. Further exploration of cognitive structural stability and change occurred through rounding MER and interview scores to the nearest structural position. Contingency tables were then used to compare first year structural position to second year structural position. The majority of the males at Position Two the first year moved to Position Three the second year (86% on the MER, 57% on

the interview) or to Position Four (7% and 4% respectively). Only a slight majority of females at Position Two the first year moved to Position Three the second year on the MER (53%) while on the interview the majority of females remained at Position Two the second year (67%). Males at Position Three the first year largely remained at that position the second year (84% on the MER, 67% on the interview). The same was true for females with 92% remaining stable on the MER and 75% on the interview.

The collective data on cognitive structural position suggests that cognitive growth occurred for both genders during the freshman year. Although female and male scores were very similar upon entrance to college, male scores were significantly higher than female scores by the beginning of the sophomore year. Males exhibited more growth to Position Three than did females and neither gender exhibited substantial growth to Position Four. These results imply that the educational environment differed in its effect on the growth of men and women and prompted more growth on the part of Position Two students than Position Three students.

Epistemological Development: Reasoning Structure Patterns

The Perry and Belenky et al. research reviewed earlier implied the existence of qualitatively different gender patterns within the same cognitive structural positions. An earlier analysis of the first year data (Baxter Magolda, in press) revealed distinct patterns despite the lack of differences in structural position. The MER and interview scoring process allowed for analysis of reasoning structures used within cognitive structural positions because reasoning structures are recorded as position scores are assigned. Female and male reasoning structure patterns were determined by comparing the percentage of females and males using each reasoning structure within a domain. To verify these patterns the domain protocols were separated by structural position and gender and reread to identify gender themes. This

procedure was used for both the MER and interview data. Results were very similar for both measures and are subsequently combined for discussion.

First Year Patterns. Qualitative differences in reasoning structure usage appeared in both Position Two and Three. Position Two women preferred learning in the clearest fashion, expecting authorities to provide them with the facts and answer their questions. Men still relied on authorities for learning but believed that authorities expected them to look for the facts themselves and expected learning to be interesting. Women more often than men emphasized the importance of a relaxed atmosphere, preferred that peers ask questions to clarify class material, and advocated peers studying together. Women placed more emphasis on evaluation based on one's knowledge of the material and suggested that multiple opportunities should be available for students to demonstrate their knowledge. Men were more likely to view evaluation of learning as a time for the teacher to correct the student. Finally, Position Two women viewed discrepancies in knowledge as different opinions about the facts whereas men viewed them as due to differing degrees of detail.

Position Three women seemed to depart from the traditional role of learner described by Position Two women. They shifted their focus to practical learning and gaining exposure to new ideas through peers. They advocated personal circumstances as a consideration in the evaluation of learning. Their male counterparts preferred a more traditional learning role, emphasizing understanding, being forced to think, and having a good relationship with the teacher. Males were more concerned than females with the fairness of evaluation procedures. Women described making decisions on the basis of what they hoped would work out in the future while men preferred options containing the most positive factors. Thus the Position Three women's reasoning pattern seemed to reflect the shift from authority that accompanies

a focus on uncertainty mentioned by Belenky et al. while the men's pattern reflected a consistent identification with authority.

Second year patterns. Position Two women described learning at the outset of their sophomore year as obtaining clear facts from instructors but engaging in activities that instructors suggested to learn for oneself. They maintained their first year emphasis on a relaxed classroom atmosphere. Position Two men emphasized learning in a clear fashion but maintained their notion that learning should be interesting and consist of activities that are good for students. Men advocated peers asking questions to clarify material rather than a relaxed atmosphere. Women continued to stress multiple opportunities for students to demonstrate their knowledge whereas men simply noted evaluation as based on knowledge of the material. Finally, Position Two women described making decisions on the basis of what was right or what others expected one to do while men decided on the basis of their preferences.

In Position Three women expressed more interest than men in self expression, being made to think, and exposure to new ideas. They advocated a rapport with the instructor, organized classes, opportunities for hands-on experience in class, and the consideration of personal circumstances in evaluation of learning. Position Three men shifted their focus to understanding and applying information to their daily lives. They stressed involvement in classes, particularly theoretical ones, to increase interest but expected class time to be used efficiently. Both men and women acknowledged certainty and uncertainty. Males more often stressed believing the most logic perspective than did females. Women tended to make decisions based on their expectations for future happiness or the number of positive factors an option entailed while men used a process they thought would yield the best choice for the future or chose on the basis of future versus short term preferences.

A Comparison of the First and Second Year Patterns. The basic female pattern remained consistent both years but the second year pattern reflected a more active role for the learner. This was evident in Position Two women's endorsement of activities in which students learn for themselves and Position Three women's preferences for self-expression, being made to think and hands-on classroom experience. This active learning role is very similar to that endorsed by men in the first year. The basic male pattern also remained consistent both years but expanded in Position Three in the second year. Position Three males seemed to show a greater independence from authority by emphasizing application to their daily lives and involvement to make learning more meaningful as opposed to being forced to think and rapport with the teacher (first year emphases). Women in the second year continued to stress a relaxed atmosphere, interaction with peers and the consideration of individual differences in learning whereas men continued to view learning as an efficient objective process.

Thus the basic differences in gender patterns remained but both genders perceived a more active role in learning the second year. The second year pattern for women in Position Three simultaneously revealed a reliance on authority and a reliance on self and peers. Although these initially appear contradictory, the reliance on authority is most likely related to areas in which knowledge is certain and reliance on self and peers related to the uncertainty of knowledge. The female emphasis on the latter matches Belenky et al.'s suggestion that women emphasize uncertainty upon its discovery. The second year male pattern maintained an objective logical stance toward learning in uncertain areas similar to that Perry described.

Environmental Influences

Interview responses, in which students shared their perceptions of their college environment, were separated by Perry position and gender and read to

identify themes. Themes emerged regarding teaching and classroom atmosphere, faculty-student interaction, and student cultures. In teaching the most prevalent theme for Position Two women was that they had learned to cope with lecture. They described mastering the techniques of learning which they listed as memorizing, highlighting readings, recopying notes, and listening. Some women wanted smaller classes in order to be closer with peers but few expressed having experienced discussion in class. Position Two men noted that lecture formats were acceptable, but most described interaction and working with others in class. They described teachers who were dynamic and communicated well and whose assignments helped students learn self motivation and discipline. Men also expressed the desire for smaller classes.

Position Three students described more active classroom experiences than Position Two students. Women in Position Three described classes in which discussion allowed them to hear others' perspectives, hands-on experience helped them translate learning into action, and they were challenged to take a stance. Only a few women at this position described large lecture classes in which they felt intimidated. Position Three men also described discussion classes but felt that arguing points of view and being made to think were beneficial to their learning. These mer also preferred smaller classes. These themes imply that those who experienced more discussion in class were more likely to move to Position Three than those who experienced the lecture format. The themes further imply that the classroom atmosphere men described was more challenging than that women described. In response to the question regarding how to judge discrepant information most students stated that they had never encountered discrepancies in classes. This may explain why the majority of students who were rated as Position Three at the start of college were still in that position after one year.

Both men and women in Position Two described a combination of intimidating and friendly interactions with teachers in class. Most expressed a desire to get to know their professors better. None expressed any interaction with faculty outside of class. The predominant theme for Position Three students was caring interactions with faculty. The men often noted the value of adult-to-adult relationships with faculty, a theme not evident in the women's descriptions. Position three men and women recounted incidents in which faculty members helped them outside of class, usually with career choices. Men additionally described engaging in class related activities outside of class. These themes confirm Chickering's (1969) hypothesis that faculty-student interaction fosters development. They also allude to subtle differences in the interactions experienced by men and women.

Aspects of the student culture described most often were living groups, social organizations and activities, and friends in general. Position Two women focused on their experiences of meeting, getting along with, and establishing friendships with others. Women often described studying together as a means of getting to know others. Position Two men focused on experiences in which peer pressure had affected their study habits or educational choices. In Position Three both women and men described being more comfortable in the college environment as a result of having friends and described studying with friends as a major theme. Women, however, described living with friends as helping them appreciate differences by learning about others whereas men described living with others as helping to learn about themselves. Gaining independence through joining a fraternity was a common theme for men.

Students of both genders in both epistemological positions stressed gaining independence as a result of living on their own. Students' most significant experience and what they valued most was usually independence and

learning to relate to others. No gender distinction appeared in this area. Although women's student culture descriptions were more often a combination of relationships and academic activities, all the student cultures described appeared to be compatible with studying and learning.

Individual Influences: Learning Styles

Chi-square analysis revealed no significant difference in learning style between women and men in either year. Learning styles did change from entrance to college to the beginning of the sophomore year. Forty-one percent of the participants maintained their first year learning style the second year. Of the men 44% remained stable and of the women 40% remained stable in learning style. For men the most stable learning style was assimilator, a combination of abstract conceptualization and reflective observation. Seventy-five percent of the males maintained this style from the first to the second year. The remaining 25% changed to the opposite style, accommodator, which is a combination of concrete experience and active experimentation. Of the males who were accommodators the first year, 70% changed to other styles the second year. For women the most stable learning style was accommodator in which 58% remained stable from year to year. The majority of women who changed from accommodator with its focus on active experimentation changed to styles involving reflective observation. The least stable style for women was assimilator in which only 18% remained from the first to the second year. These women, who initially preferred reflective observation, changed to styles involving active experimentation. These changes could be interpreted as support for Kolb's explanation of the acquisition phase of learning style development in which individuals develop preferences which aid them in their learning environments.

An analysis of variance of epistemological development position by learning styles revealed no significant differences. No clear patterns of

learning style change emerged from comparing Position Two and Position Three students' learning styles from year to year. Given the degree of change in learning style and the lack of distinct relationship of learning style to epistemological position, it seems that the environmental conditions were more influential than learning styles in freshman year epistemological development.

Conclusions

Collectively these data support the hypothesis that freshman year epistemological development differs in subtle ways for men and women. Men and women entered college with very similar cognitive structures although women's reasoning patterns within those structures suggested a less active learning role and more attachment to peers. Given the environments described by each gender, males entering reasoning patterns of being actively involved and challenged were reinforced in the learning environment. This active involvement may account for males increased reliance on self in learning in the second year as well as their increased epistemological complexity. Environments described by women as incorporating active involvement reinforced women's interest in learning others' views but not necessarily establishing their own. Thus women remained more reliant on authority and peers at Position Three than did men.

Two plausible interpretations emerge from comparing the collective results to earlier research. First, it is possible that despite similar learning styles and entering cognitive structures, males experience more growth during the freshman year than do females. Although the difference in overall means by gender is not statistically significant, more males clearly moved to Position Three than did females. The interaction of male reasoning patterns and the learning environment seems to be influential in epistemological growth. Similarly, women's reasoning patterns involving less active involvement may also have been reinforced by instructors not challenging them to establish their own views.

Second, it is possible that some women's discovery of the legitimacy of their own views, and thus their increased epistemological development, remained hidden. Women's focus on hearing others' ideas implies collecting those ideas for one's own thinking. However, only Position Three women described learning environments that supported expression of one's own views. Position Two women described lecture formats. It is also possible that women's emphasis on peer relations in class was a priority over expressing one's opinion. Women's comments related to student culture expressed viewing self in relation to others rather than others in relation to self which was more common among the men.

Either explanation poses a challenge for educators. If women function at a less complex level in the educational environment than their male counterparts, the likelihood of differential treatment increases. The potential increases for males to be challenged and reinforced while females receive less attention because they appear less capable or motivated to participate in ways traditionally valued by faculty. Heightened awareness on the part of faculty of women's reasoning patterns is necessary to incorporate their learning preferences into teaching. Active involvement which emphasizes hearing others' views in a collaborative environment but still challenges students to establish their own stance would provide women with the reinforcement men apparently experience. Learning activities that legitimate expressing one's views without jeopardizing peer relations would encourage women to take the risks associated with exploring one's beliefs. Instructor reinforcement for independent thinking would reduce women's reliance on authority much in the same way it does for men. These teaching activities assume that faculty encourage women to value themselves as knowers and support reliance on women's experience as a foundation for exploring knowledge. Clinchy, Belenky, Goldberger, and Tarule (1985) notes these two assumptions

as central to the "connected" teaching relevant to women. Increased faculty-student interaction may be particularly important for women since they tend not to identify with authority figures as readily as do men (Belenky et al., 1986). Clinchy et al.'s (1985) emphasis on an egalitarian environment in which teachers allow flaws in their own thinking to be seen by students would also aid women in relating more readily to authority figures.

Further research regarding the complex interaction between student reasoning patterns, environmental conditions, learning styles, ar' epistemological development is required to delineate clearly the environmental conditions necessary to achieve equity in higher education learning environments. Longitudinal research is essential to establish the patterns of change across the college experience. Observation of students in class could distinguish subtle differences men and women experience in the learning environment. Observation of teachers could identify the degree to which characteristics of connected teaching are present in the classroom. Intentionally designed learning environments could identif: ne effects of various conditions on epistemological development. Obtaini, faculty members' perspectives on learning and teaching could explain potential differences in interactions with women and men students and the learning environments faculty create.. These avenues of inquiry are crucial to achieving gender equity in higher education and insuring increased epistemological development as an outcome of higher education.

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